



Fitzjohn, S., Palmer, Z., Baptist, M., & Robinson, E. (2016). *Online practicals for undergraduate pharmacology courses and the provision of student feedback*. Poster session presented at Promoting and sharing excellence in Higher Education teaching, London, United Kingdom.

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Online practicals for undergraduate pharmacology courses and the provision of student feedback

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Introduction

Alternatives to traditional 'wet' laboratory practical required as increases in student numbers puts pressure on laboratory time and space. At the University of Bristol,

our Pharmacology teaching lab accommodates 120 students, but in the current academic year student numbers on one first and one second year BSc Pharmacology unit are 187 and 144 respectively. Due to timetabling constraints we have not been able to run additional laboratory sessions and so have had to develop online-only practicals to replace previous laboratory practicals

All our practicals currently utilise our online dynamic laboratory manual, eBiolabs (<http://www.bristol.ac.uk/ebiobabs/>) which provides experimental information and pre- and post-lab quizzes, including providing feedback. The new online practical expand the use of eBiolabs to direct student activities including measurement of data traces, generation of graphs and calculation of pharmacological parameters. We have also trialled additional activities to provide feedback and support for these new practicals.

Units using online practicals

Pharmacology 1A - 9 practicals in total (3 online-only)

Online practicals on 'Introduction to Labchart', 'Antagonism' and 'Autonomic control of the cardiovascular system'.

Pharmacology 2A - 9 practicals in total (2 online-only)

Online practicals on 'Local anaesthetics' and 'Cholinergic modulation of learning and memory'.

Two units running in Teaching Block 1 (September –December)
Each unit runs 1 x 3 hr lab session per week

Measurement of local anaesthetic drug effects on the nerve action potentials – previously a 'wet' laboratory practical using frog sciatic nerve. Issues with obtaining tissue for the practical made this a prime candidate for moving to online only.

Local anaesthetic practical

This practical is used by Dentistry and Medicine as well as Pharmacology students. For Pharmacology the students access the online material and complete the data analysis and quizzes in their own time.

Measurement of local anaesthetic drug effects on the nerve action potentials

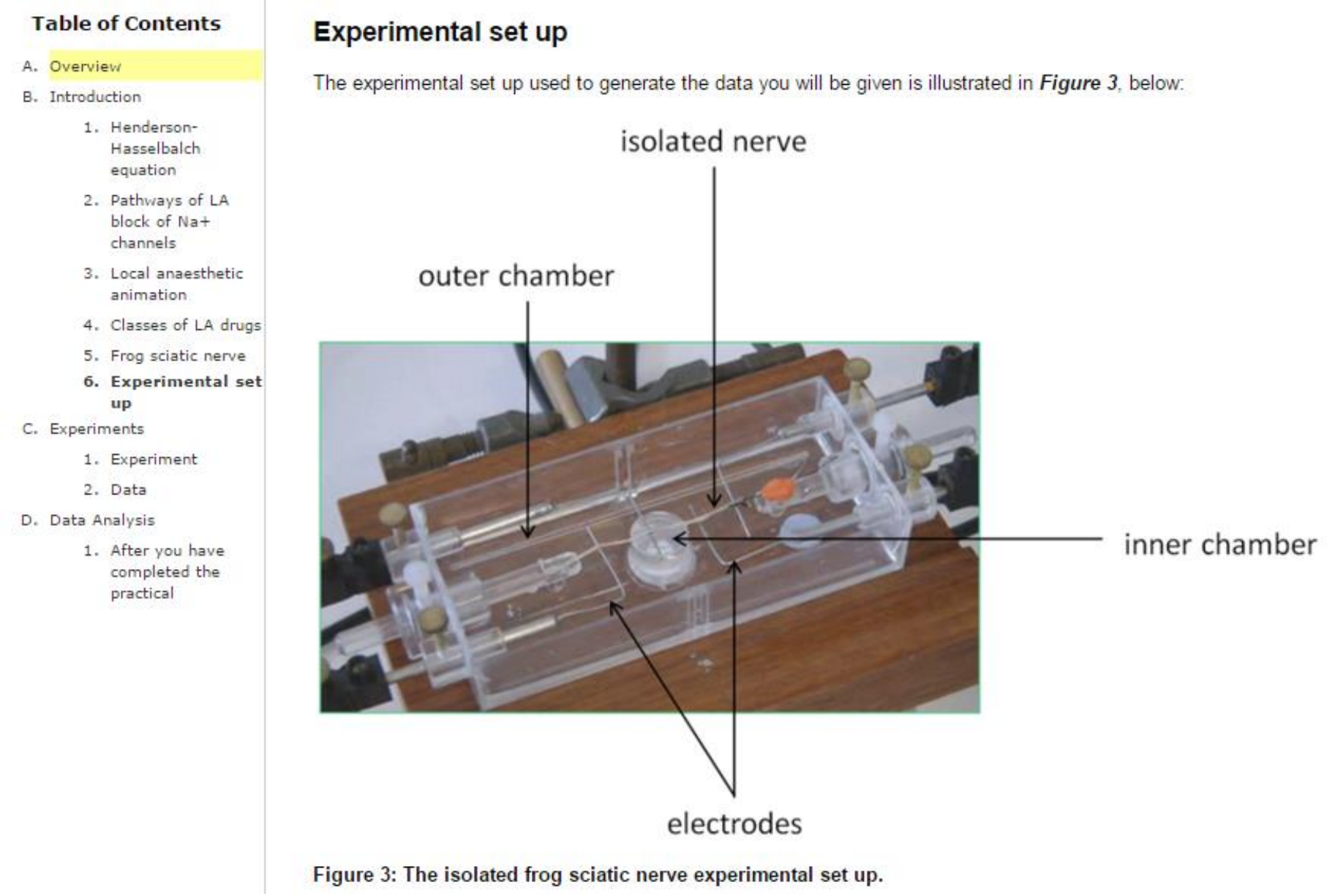


Figure 1: Experimental information on eBiolabs. The eBiolabs webpages for the practical provide information on the experimental setup used to collect the data the students are provided with. Questions in the pre-practical online quiz on this material aim to ensure students engage with the experimental information. Additional information on local anaesthetics, their mode of action and the Henderson-Hasselbalch equation is also provided to supplement lecture material.

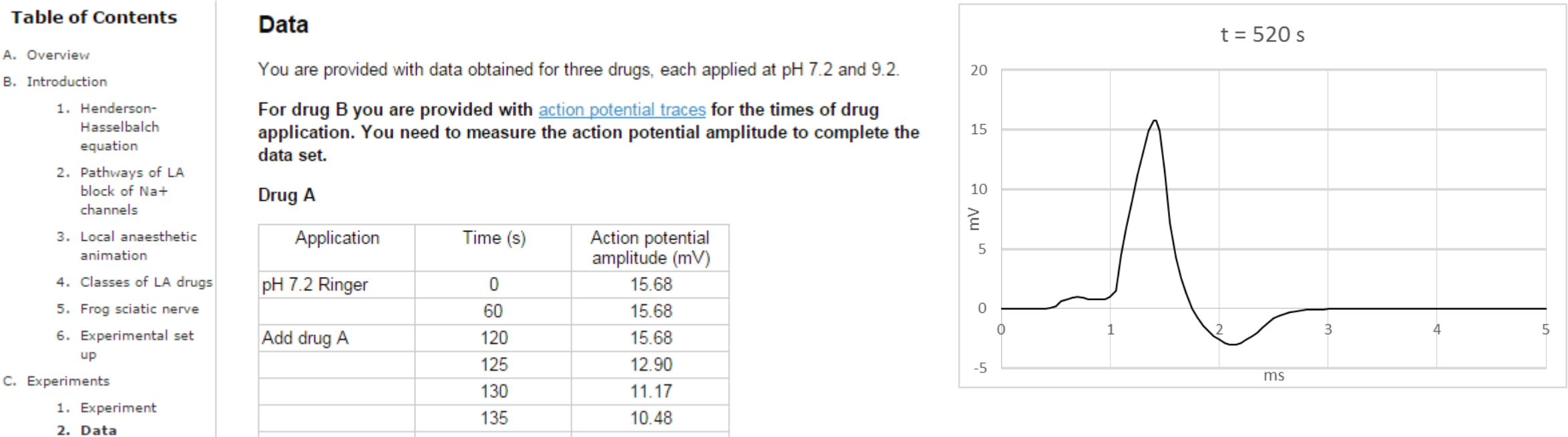


Figure 2: Data collection. Students are provided with data on eBiolabs (in this example effect of addition of an unknown local anaesthetic on action potential amplitude), and also have to measure the amplitude of example traces to complete the data set (example trace shown – these are also provided as paper copies to students).

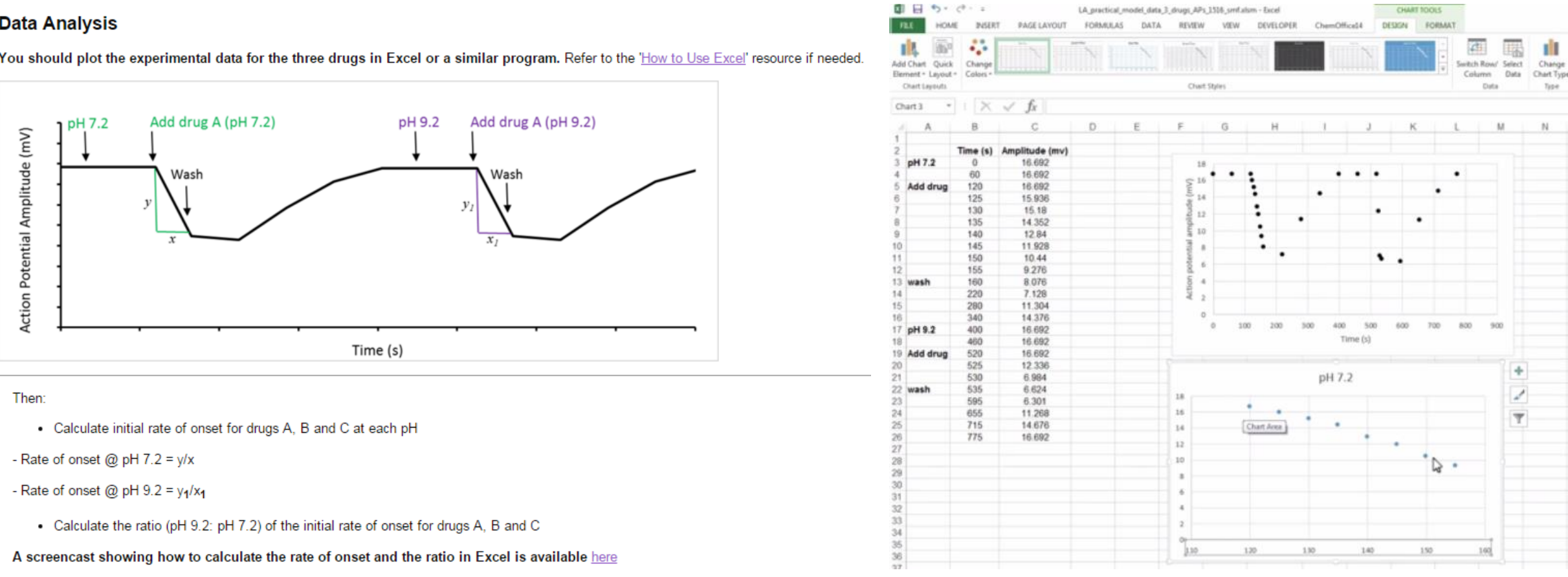


Figure 3: Data analysis. Students are given instructions on eBiolabs on how to analyse the data (left). This is supplemented by video tutorials (right) for example on how to use Excel to construct graphs and fit lines of best fit to calculate slopes.

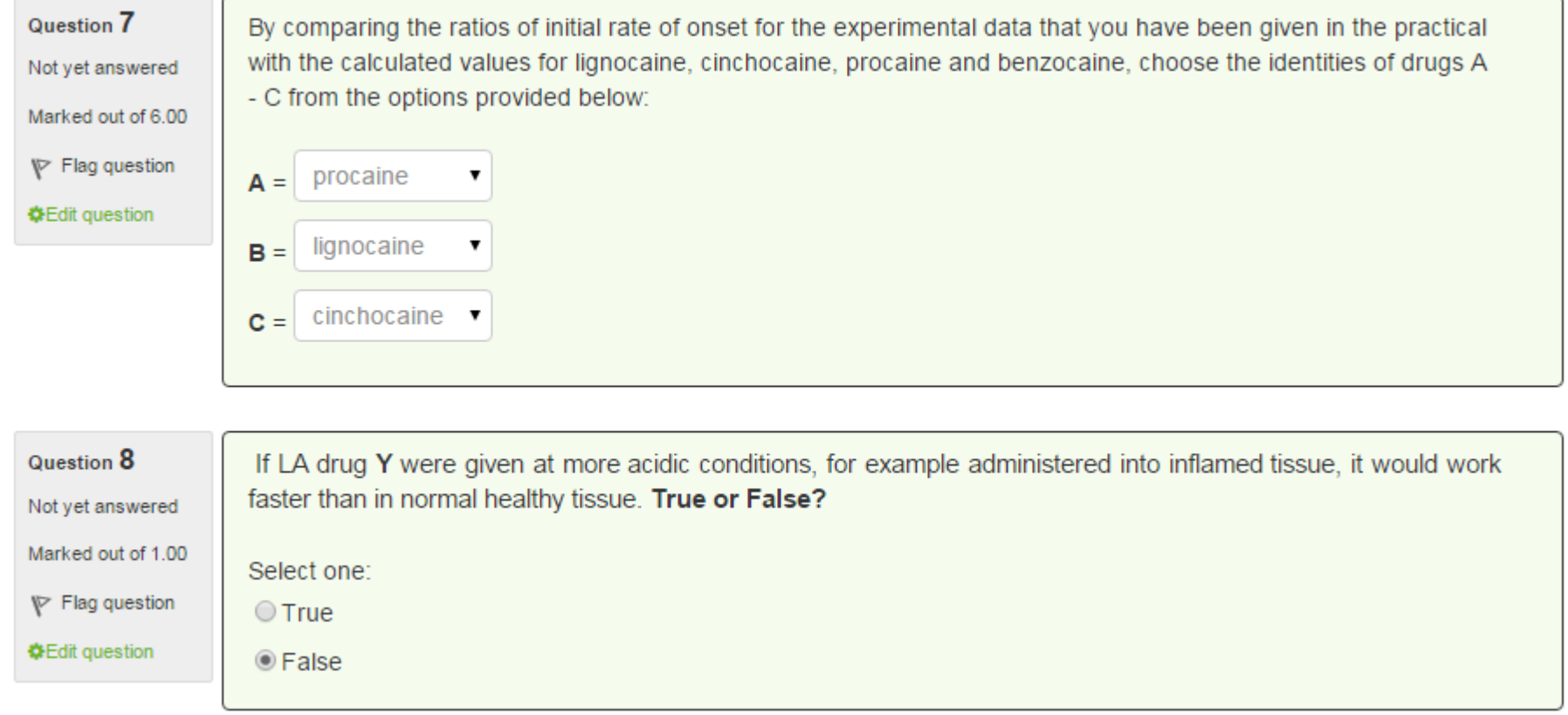
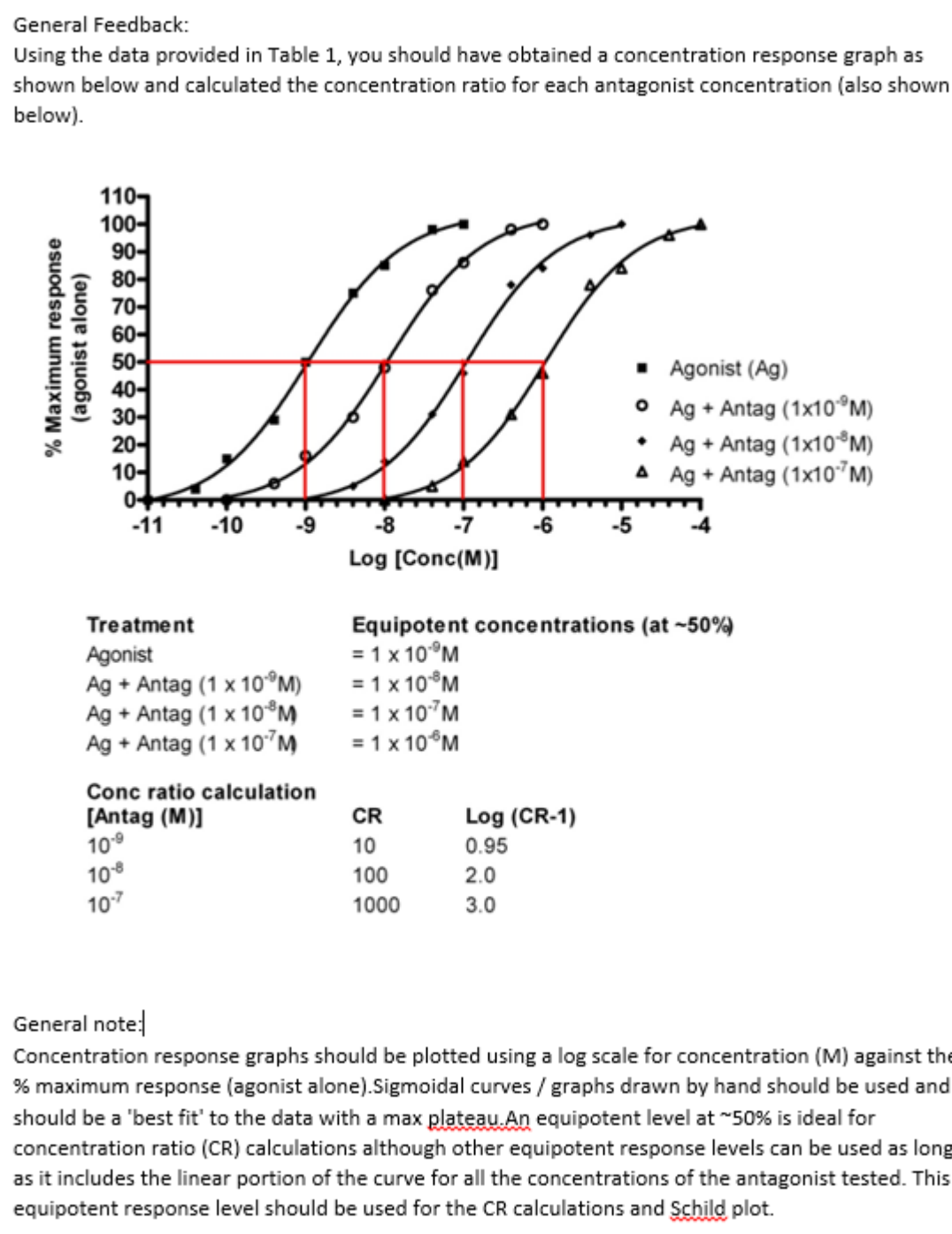


Figure 4: Post-lab quizzes. Online quizzes test the students on data analysis and their understanding of the concepts underlying the practical.

Figure 5: Online feedback. eBiolabs provides feedback to students once the quizzes have closed. This can be general feedback or tailored depending on their answer (example from a different practical).

This year we have also run 'drop-in' sessions for students to ask questions about the online practicals but attendance has been patchy.

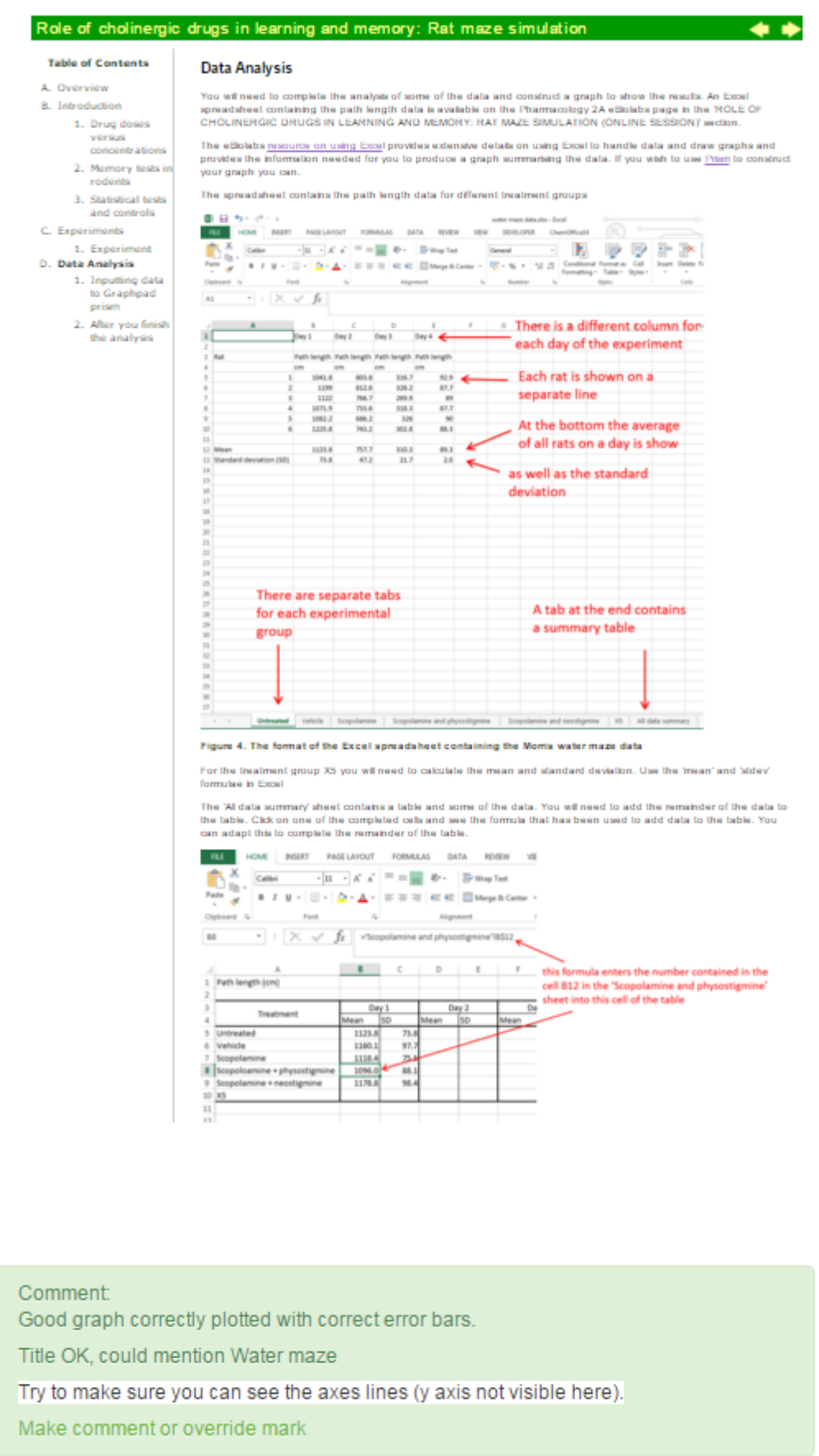
Video recordings of feedback will be trialled next year.



Cholinergic modulation of learning

Figure 6: Second online practical. This online practical for Pharmacology 2A required students to utilise data they were provided with. An incomplete Excel spreadsheet was provided in which students had to complete some calculations (mean and standard deviation) and use look-up formulae to complete a summary table (top).

They also had to submit online a plot of the data following a guideline format. These submission were then graded and online feedback given (bottom, example feedback).



Student performance and evaluation

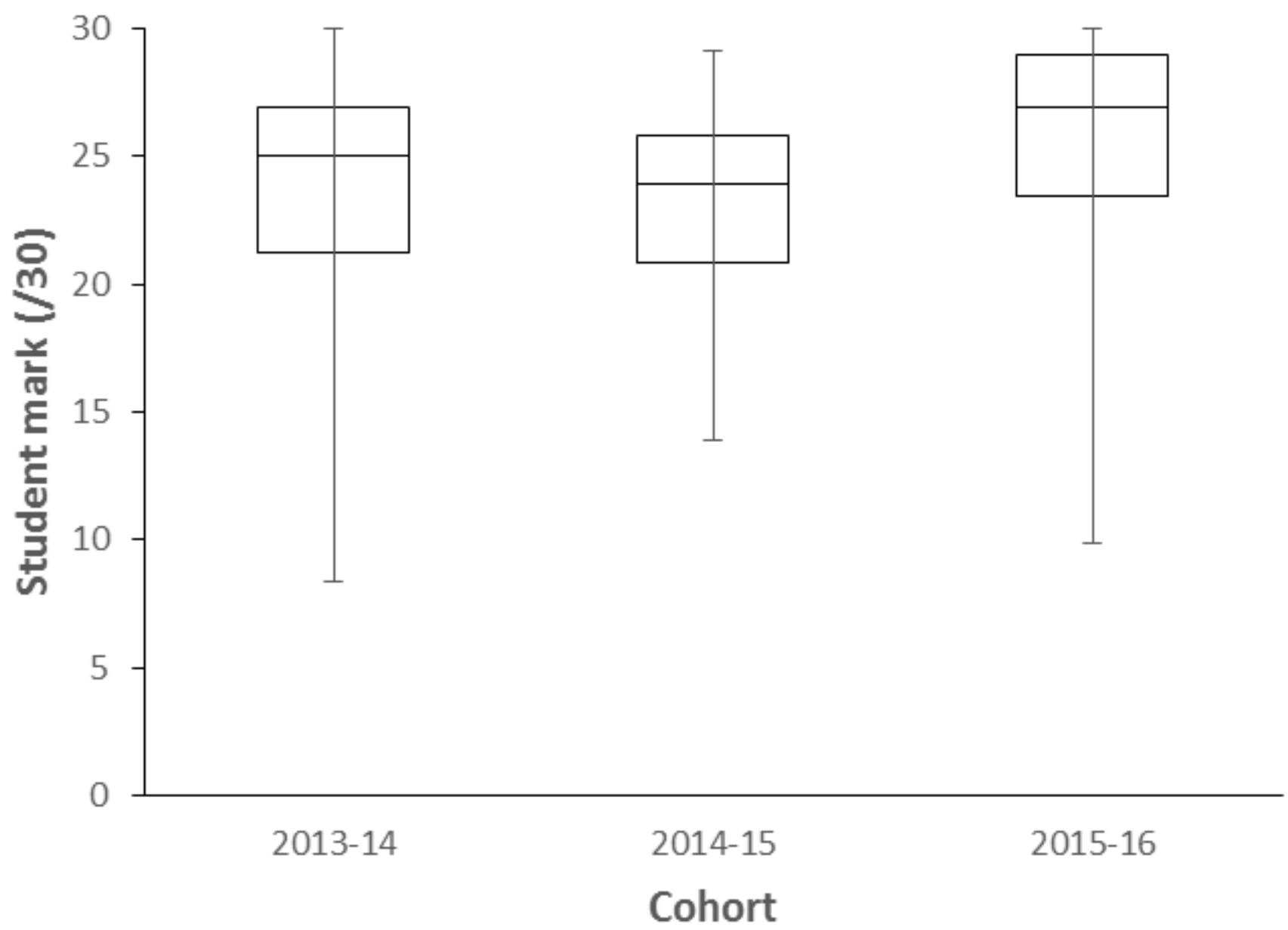


Figure 7: Student performance on local anaesthetic post-lab quiz. The post-lab quiz for this practical was not majorly changed from previous years. Attainment was higher for the current cohort who did the online-only practical than for the previous two years who carried out a different version of the practical. Previously this was designed as a wet practical but limited availability of tissue meant the students were often given model data but with less structured instruction on analysis.

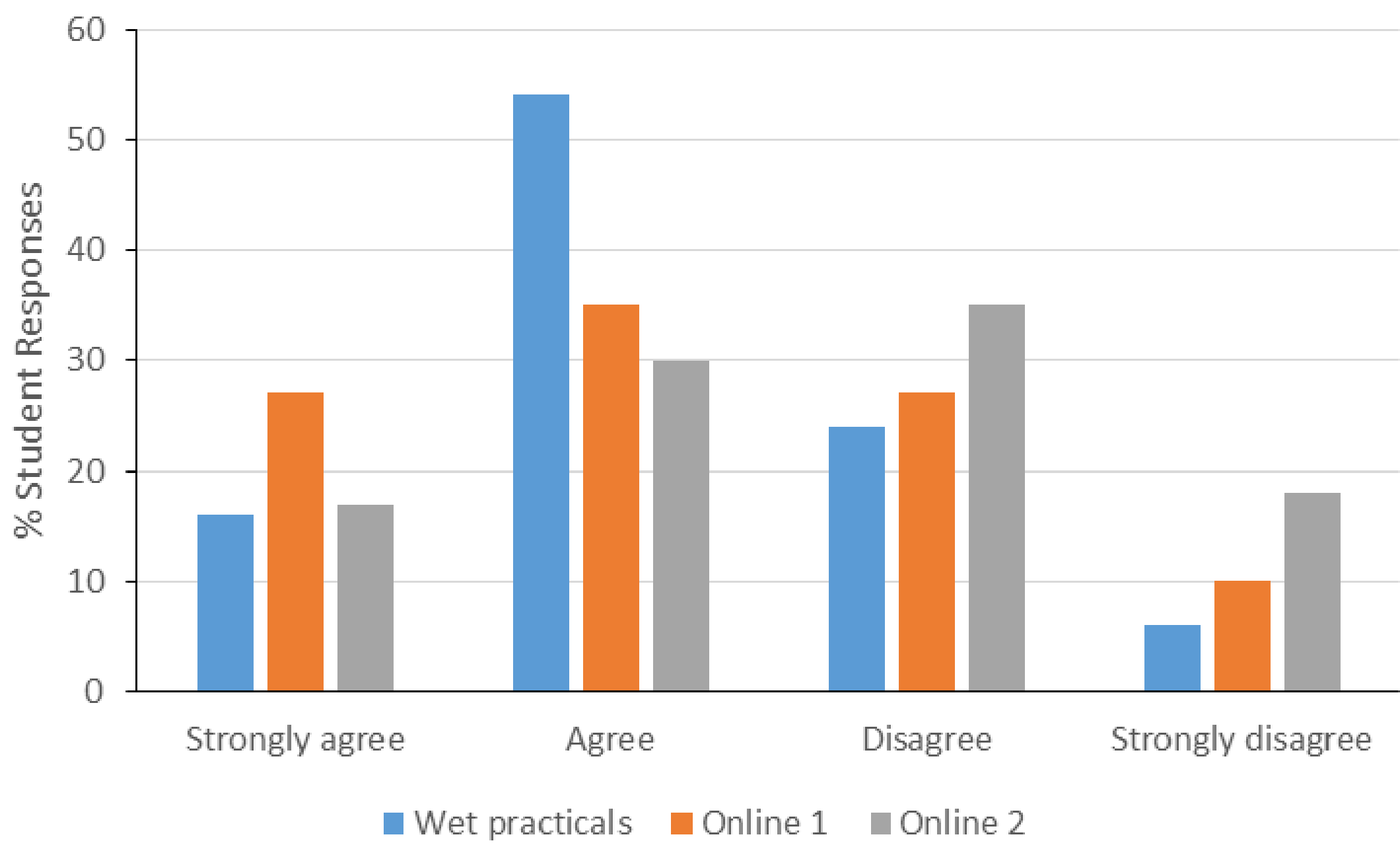


Figure 8: Student evaluation of practicals. During the end of unit evaluation for the Pharmacology 2A unit 2015-16 cohort, students were asked to indicate agreement/disagreement with the statement "The elements of the course were interesting and informative" for different parts of the unit. The graph shown responses for 'Wet practicals', 'Local anaesthetic practical' (online 1) and 'Cholinergic modulation of learning' (online 2).

Although students could provide additional written feedback on questions asked during the evaluation session, no additional specific comments were given on the online practicals.

Students will be invited to take part in a small 'focus-group' style meeting to gather additional information on the usefulness and content of the online practicals

Conclusions and Future Plans

The development of online practicals has allowed us to teach larger cohorts within the timetabling constraints that exist without removing content.

Students engaged will with the material and completed the associated quizzes (which are associated with a small contribution to overall unit marks).

Feedback has primarily been given to students using our online system. 'Drop-in' sessions attracted a small number of students. Video feedback will be trialled in future.

Student marks for the Local Anaesthetic practical increased on previous years, although this analysis is not possible for other practicals which have been substantially changed compared to previous years.

Focus groups will be used to collect more student views on the online practicals; initial evaluation suggests the current online practicals are not as 'interesting and informative' as traditional 'wet' practicals.